Elliptic cohomology and the Fourier-Mukai transform

Recently, there has been rapid development in using equivariant elliptic cohomology in the context of enumerative geometry, representation theory, and mathematical physics. In particular, the elliptic stable envelope for symplectic varieties is defined, and a 3d mirror symmetry statement is given by Okounkov. For cotangent bundles of flag varieties the stable envelope is constructed by Rimanyi-Weber using algebraic geometry, and they are transformed by the newly defined elliptic Demazure-Lusztig (DL) operators. These operators can be thought of as rational sections of a certain vector bundle over $A \times A^\vee$, where A is (the spectrum of) the equivariant elliptic cohomology of a point and $A^\vee$ is its dual abelian variety. Classically, there is an equivalence between the derived categories of A and $A^\vee$, defined by the Poincare line bundle, called the Fourier Mukai transform. The module category over the elliptic affine Hecke algebra, defined by Ginzburg-Kapranov-Vasserot, is a subcategory. In this talk I will define an equivalence between this module category and that for the Langlands dual system. This functor is constructed by using an algebra over $A \times A^\vee$ determined by the elliptic DL operators. This is joint work with G. Zhao.